The choice NOTA means "None of the Aforementioned". Good luck and have fun! Remember, figures are not drawn to scale. Unless specified, assume any length is in units.

1. Assume the statement "If Jack is good at math, then he is cool" is true. Which statement below must also be true?

   (A) If Jack is cool, then he is good at math.
   (B) If Jack is not cool, then he is not good at math.
   (C) If Jack is not good at math, then he is not cool.
   (D) If Jack is not good at math, then he is cool.
   (E) NOTA

2. What is the sum of the interior angles of a 2018-gon?

   (A) 363880 (B) 362870 (C) 362880 (D) 360 (E) NOTA

3. A particular hexagon has angle measures $(x+5)^\circ$, $(2x-7)^\circ$, $(3x-70)^\circ$, $(3x+50)^\circ$, $(2x-53)^\circ$, and $(x+15)^\circ$. By how many degrees do the largest angle and smallest angle differ?

   (A) 175 (B) 168 (C) 122 (D) 120 (E) NOTA

4. A cylinder is inscribed in a sphere. The radius of the sphere is 10, and the height of the cylinder is 12. What is the surface area of the cylinder?

   (A) 768π (B) 320π (C) 256π (D) 192π (E) NOTA

5. What is the sum of the coordinates of the centroid of a triangle with vertices $(5, 6)$, $(16, 28)$, and $(-6, -16)$?

   (A) 9 (B) 10 (C) 11 (D) 12 (E) NOTA

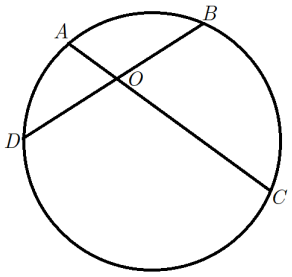
6. An isosceles triangle having integral side lengths has one side that is 2018 units long. What is the smallest possible perimeter of such a triangle, in units?

   (A) 4036 (B) 4037 (C) 4038 (D) 4039 (E) NOTA

7. Point A exists on side $\overline{YZ}$ of triangle XYZ such that segment $\overline{AX}$ bisects $\angle YXZ$. Given that $\overline{XY} = 18$, $\overline{YZ} = 25$, and $\overline{XZ} = 12$, what is the sum of the squares of the lengths of $\overline{AY}$ and $\overline{AZ}$?

   (A) 325 (B) 300 (C) 313 (D) 625 (E) NOTA

8. Two chords $\overline{AC}$ and $\overline{BD}$ intersect at a point O. Arc AB measures 57 degrees, and arc CD measures 161 degrees. What is the degree measure of $\angle AOD$?



(A) 109 (B) 104 (C) 76 (D) 71 (E) NOTA

9. How many of the following statements are always true?

i. Any two points in three-dimensional space determine a line.
ii. The centroid of a triangle lies inside the triangle.
iii. The intersection of a cone cut horizontally by a plane is a triangle.
iv. Three distinct points in three-dimensional space determine a distinct plane.

(A) 1 (B) 2 (C) 3 (D) 4 (E) NOTA

10. Which term is defined as a point that is equidistant from the vertices of any non-degenerate triangle?

(A) Circumcenter
(B) Incenter
(C) Centroid
(D) Orthocenter
(E) NOTA

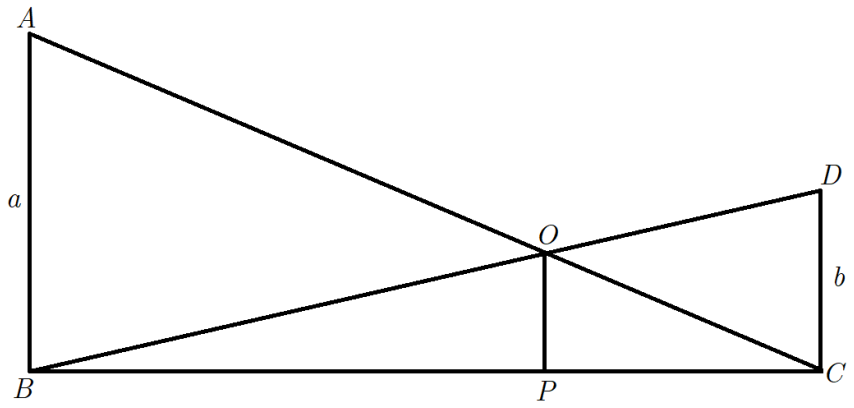
11. Name the segments that are concurrent at the point denoted in the previous question.

(A) Angle bisectors
(B) Altitudes
(C) Perpendicular bisectors
(D) Medians
(E) NOTA

12. A triangle has two sides that measure 58 units and 61 units. How many possible integer lengths, in units, of the third side exist such that the triangle is obtuse?

(A) 117 (B) 115 (C) 64 (D) 49 (E) NOTA

13. In the diagram below, $\overline{BD}$ and $\overline{AC}$ intersect at a point O, while point P is on $\overline{BC}$ such that $\overline{AB}$ is parallel to $\overline{OP}$. Given that $\overline{AB}$ is also parallel to $\overline{DC}$, $\overline{AB}$ has length a, and $\overline{CD}$ has length b, what is the general length of $\overline{OP}$ in terms of a and b?



(A) $\sqrt{ab}$ (B) $\frac{ab}{a+b}$ (C) $\frac{2ab}{a+b}$
(D) $a-b$ (E) NOTA

14. What is the locus of points equidistant from a single point in space?

(A) A line
(B) A square
(C) A circle
(D) An equilateral triangle
(E) NOTA

15. Let $ABCD$ be a square with $AB = 2$. Points E and F are on $\overline{AB}$ and $\overline{CD}$, respectively, such that $\overline{EF}$ passes through the center of the square and $\angle EFC = 70°$. Let $[K]$ denote the area of figure K. Find $[BEFC]$.

(A) 1/2 (B) 1 (C) 2 (D) 4 (E) NOTA

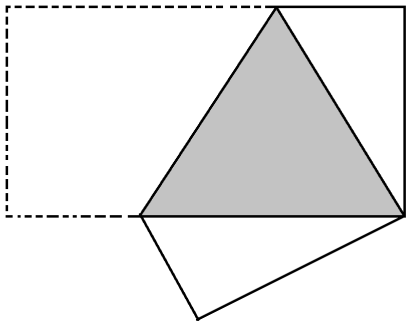
16. A convex quadrilateral $MATH$ is constructed such that $\overline{MA} = 22$, $\overline{AT} = \overline{HM} = 13$, $\overline{TH} = 32$, and $\overline{MA} \parallel \overline{TH}$. The midpoint of $\overline{MA}$ is E. What is the length of segment $\overline{EH}$, ignoring units?

(A) 12 (B) 15 (C) 16 (D) 20 (E) NOTA

17. A convex pentagon has side lengths 8, 12, 14, 7, and x, in that order. What is the sum of the possible integer values of x?

(A) 351 (B) 754 (C) 806 (D) 820 (E) NOTA

18. A rectangle with dimensions 8 by 15, shown below, is folded such that two opposite points of the rectangle touch each other. What is the area of the overlapping region?



(A) $\frac{18496}{225}$ (B) $\frac{578}{15}$ (C) 40 (D) $\frac{322}{15}$ (E) NOTA

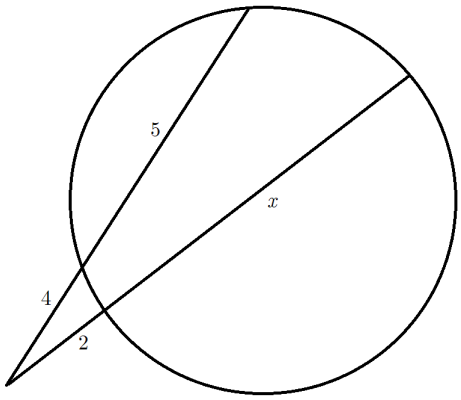
19. Trapezoid $OVAL$ has $\overline{OV} \parallel \overline{AL}$ and points B and C are the midpoints of the sides $\overline{OL}$ and $\overline{VA}$, respectively. Diagonals $\overline{OA}$ and $\overline{VL}$ intersect at a point D. Additionally, they intersect segment $\overline{BC}$ at points P and Q, respectively. Given that $\overline{OV} = 17$ and $\overline{BC} = 48$, what is the length of $\overline{PQ}$?

(A) 31 (B) 32 (C) 40 (D) 41 (E) NOTA

20. In $\triangle ABC$, let $\overline{AB} = 7$, $\overline{BC} = 6$, and $\overline{AC} = 8$. Given that point D lies on $\overline{AB}$, point E lies on $\overline{BC}$, $\overline{AD} = 3$ and $\overline{BE} = 2$, there exists a unique point F that lies on $\overline{AC}$ such that $\overline{AE}$, $\overline{CD}$, and $\overline{BF}$ are concurrent. If the length of $\overline{AF}$ can be written in the form $\frac{a}{b}$ for relatively prime positive integers a and b, then what is the value of $a + b$?

(A) 13 (B) 35 (C) 49 (D) 75 (E) NOTA

21. Two chords of a circle are extended such that they intersect at a point outside of the circle. Given the lengths in the diagram below, solve for x. (Note: The figure is not drawn to scale.)



(A) 2.5 (B) 7 (C) 10 (D) 16 (E) NOTA

22. Two real numbers, x and y, not necessarily distinct, are chosen such that $0 \leq x \leq 5$ and $-5 \leq y \leq 0$. What is the probability that the sum of x and y is a real number that is at least -2?

(A) 0.6 (B) 0.76 (C) 0.82 (D) 0.84 (E) NOTA

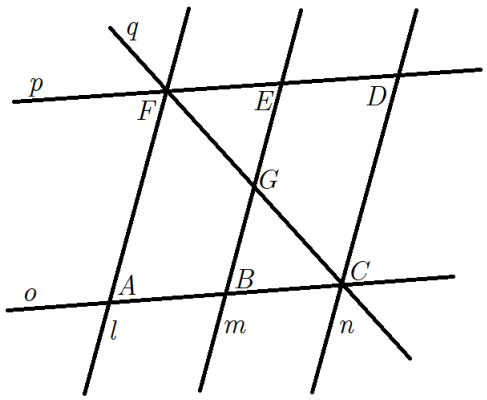
23. $\triangle MAO$ exists such that $\angle AMO \cong \angle MAO$. The perpendicular bisector of $\overline{AO}$ intersects side $\overline{MA}$ at a point N, forming a 60° angle with segment $\overline{AN}$. Given that $\overline{AO} = 18$, what is the length of $\overline{MN}$?

(A) $3\sqrt{3}$ (B) $6\sqrt{3}$ (C) $9\sqrt{3}$ (D) $12\sqrt{3}$ (E) NOTA

24. There exists $\triangle ABC$ with side lengths 6, 7 and 10. Let points D, E, and F be the feet of the altitudes to sides $\overline{BC}$, $\overline{CA}$ and $\overline{AB}$ respectively. Find the ratio of the area of the circumcircle of triangle $\triangle DEF$ to the area of the circumcircle of triangle $\triangle ABC$.

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{2}{7}$ (D) $\frac{3}{8}$ (E) NOTA

For questions 25-27, refer to the diagram and information below.
Lines l, m, and n are parallel to each other, and tranversals o and p are parallel to each other. A, B, C, D, E, F, and G are all of the points of intersection of the lines, and line q passes through points C and F. Furthermore, $\overline{AB} = \overline{BC} = \overline{DE} = \overline{EF} = \overline{BG} = \overline{GE} = 1$.



25. What is the area of trapezoid $BAFG$ if $\angle BCD$ is 120°?

(A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$ (C) $\frac{3}{4}$ (D) $\frac{3}{2}$ (E) NOTA

26. What is the ratio of the area of trapezoid $CDEG$ to the area of triangle ABG? Express your answer in simplest form.

(A) 3 (B) 4 (C) $\frac{5}{2}$ (D) $\frac{8}{3}$ (E) NOTA

27. Given that $\angle BCD$ is 120°, what is the value of $\frac{\sin(\angle EFG)}{2}$?

(A) $\frac{3}{4}$ (B) $\frac{3}{2}$ (C) $-\frac{3}{4}$ (D) $-\frac{3}{2}$ (E) NOTA

28. Only certain numbers can be expressed as the number of diagonals of a regular n-gon. Let y be the greatest such number less than 2018. Find the sum of the digits of y.

(A) 8 (B) 12 (C) 14 (D) 16 (E) NOTA

29. A bug travels along the exterior of a rectangular prism measuring 6 cm by 8 cm by 10 cm from a corner A to a corner opposite corner A, known as corner B. What is the shortest possible distance, in centimeters, traveled by the bug from corner A to corner B?

(A) $6\sqrt{10}$ (B) $2\sqrt{74}$ (C) $8\sqrt{5}$ (D) $2\sqrt{58}$ (E) NOTA

30. A snake, perfectly curled along the circumference of the bottom base of a cylinder with radius $\frac{2}{\pi}$ feet, slithers along the surface of the cylinder at a speed of 10 feet per second until it touches a point on the circumference of the top base opposite its starting point and has traveled around the cylinder 36 times on the way up. Another snake (the same length as the other snake) also is perfectly curled along the circumference of the top base of the same cylinder, but slithers along the surface of the cylinder at a speed of 17 feet per second until it touches a point on the circumference of the bottom base opposite its starting point and has traveled around the cylinder 90 times on the way down. Both snakes take parallel paths and start at the same time. Given that both snakes travel the shortest possible distance and arrive at their respective bases at the same time, what is the height of the cylinder, expressed in feet?

(A) $36\sqrt{10}$ (B) 96 (C) $36\sqrt{29}$ (D) 192 (E) NOTA